

Alaska Department of Fish and Game  
Division of Wildlife Conservation  
**September** 2003

## Ecological Studies of the Kenai Peninsula Brown Bear

Sean Farley  
Grant Hilderbrand

**Annual** Research Performance Report  
1 July 2002–30 June 2003  
Federal Aid in Wildlife Restoration  
Grant W-33-1, **Project** 4.29

This is a progress report on continuing research. Information may be refined at a later date.

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**FEDERAL AID  
RESEARCH PERFORMANCE REPORT**

ALASKA DEPARTMENT OF FISH AND GAME  
DIVISION OF WILDLIFE CONSERVATION  
PO Box 25526  
Juneau, AK 99802-5526

**PROJECT TITLE:** Ecological studies of the Kenai Peninsula brown bear

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**COOPERATORS:** Kenai National Wildlife Refuge, United States Fish and Wildlife Service, US Dept. of Interior; Chugach National Forest, US Forest Service, US Dept. of Agriculture; Kenai Fjords National Park, National Park Service.

**GRANT AND SEGMENT NR.:** W-33-1

**PROJECT NR.:** 4.29

**SEGMENT PERIOD:** 1 July 2002 – 30 June 2003

**WORK LOCATION:** Kenai Peninsula

**STATE:** Alaska

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- I. PROGRESS ON PROJECT OBJECTIVES** Assess survivorship and recruitment to evaluate perceived population trends seen in recapture data. *Eight new female bears were added to the Kenai database in the summer/fall of 2002, and an additional 6 were captured in spring of 2003. There were no capture mortalities during this reporting period. We now have 21 female bears on the air. Telemetry flights are continuing to determine cub production and survivorship, but data analyses are not complete at this time.*
1. Determine if Kenai brown bears represent a population exhibiting large litter sizes and early weaning. *Data analyses are not complete.*
  2. Measure the degree of heterozygosity seen in the Kenai brown bears, and calculate an “effective population size” ( $N_e$ ). *We had a graduate student complete his Master's degree investigating the genetic health of the Kenai brown bears. He completed all work and graduated in spring of 2003.*
  3. Assess habitat use, identify key travel corridors, and quantify the nutritional resource needs of adult male brown bears. *Only one male was handled this year. This objective must be revised.*

4. Experimentally evaluate if the management concept of “buffers” has biological relevance to Kenai brown bears. *No work has been accomplished on this objective.*
5. Continue to evaluate and refine the cumulative effects model. *The USFS is continuing refinement of the RSF functions. We have expanded the work to look at highway crossings and bears, and we will have a manuscript for publication this fall.*
6. Develop and apply new technologies (e.g., video collars, triaxial accelerometers) to ecological studies of bears. *A camera collar was successfully deployed on a bear in October of 2002. He wore the collar for approximately 1 month, and it recorded 990 images*
7. Determine if the geographic range of Kenai Peninsula brown bears extends into Prince William Sound. *In conjunction with the Kenai Fjords National Park, personnel spent 4 weeks placing hair snares on salmon streams throughout the Park. We have the hair samples and will be running DNA analysis this winter to determine species. Only a few (<5 samples possibly appear to be brown bear).*
9. Continue publication and report writing. *I assembled and attached a complete list of all publications associated with this project over the years.*

## **II. SUMMARY OF WORK COMPLETED ON JOBS IDENTIFIED IN ANNUAL PLAN THIS PERIOD** (Related Objective numbers are indicated in parentheses).

1. Assess population trend from additional data on population age structure, adult and offspring survival, and offspring recruitment. Information will be collected in the course of radio-collaring across the peninsula (1,2) *A total of 25 tracking flights were conducted this year, resulting in 200 radio-relocations. During the period of this report, 1 female had cubs-of-the-year (4 offspring); two females had yearlings (3, and 2 respectively), two females had two-year olds (2 each), and the remaining bears had no cubs. Analysis continues.*
2. Use biological samples (blood and tissue) collected from radiocollared and sealed bears for mitochondrial and microsatellite analyses. *The calculated average observed heterozygosity ( $H_o$ ) for all the brown bears on the Kenai Peninsula ( $H_o$ ) was  $0.639 \pm 0.043$  with a calculated expected heterozygosity ( $H_e$ ) of  $0.637 \pm 0.042$ . For all the brown bears on the peninsula the average number of alleles per loci was calculated to be  $6.38 \pm .46$ . Mean inbreeding coefficient was not significantly different from zero ( $F = 0.0001$ ;  $X^2 = 38.8$ ;  $\alpha = 0.05$ ). Only two haplotypes were identified for the entire peninsula. Thirty-seven of the 38 bear samples possessed haplotype A. The other, haplotype B was found in one brown bear in the northern portion of the Kenai Peninsula. Ten polymorphic sequence sites were found between the 2 haplotypes. This gave the Kenai brown bear a gene diversity index of  $h(V_h) = 0.052 \pm 0.049$  and a nucleotide diversity of  $\pi(V_\pi) = 0.001 \pm 0.001$ .*
3. Specifically capture adult male brown bears for radiocollaring and biological sample collection. Employ new technology (remote release Global Positioning System (GPS), video, and tri-axial accelerometer collars, stable isotope and fatty acid signatures, and total body water dilution to better assess the nutritional ecology (e.g. seasonal diet and changes in body composition) of adult male brown bears (1,3,4,7). *The collaring of large adult male brown*

*bears continues to be problematic, and we only handled one male incidental to handling a breeding female.*

4. Conduct snaring in areas critical to management, but impossible to work by air (5). *No additional snaring was conducted.*
5. Develop algorithms to simulate the assumed biological basis of "buffers," utilizing extensive location data collected by GPS collars. Attempt to conduct controlled field experiment to test assumptions, using radiocollar animals in areas with known timber (5). *No work was accomplished on this job this year.*
6. Continue to map brown bear locations collected via aerial telemetry and GPS collars for identification of habitat use, peninsula-wide species range, and discrete travel corridors (6) *Eight (8) bears were handled (helicopter darting), 5 were outfitted with GPS-SOB collars that worked flawlessly. Together, these collars recorded approximately 24,000 locations of bear activity centered near the east end of Tustumena Lake.*
7. Incorporate the soon-to-be-released Peninsula vegetation map for testing and refinement of the cumulative effects model (6). *No additional work has been accomplished on this.*
8. Collect scat samples from select salmon streams on the Peninsula's east coast; use DNA-based techniques to determine if the samples are black or brown bear in origin (8). *Approximately 150 scat samples and 50 hair samples have been collected from streams on the Kenai National Wildlife Refuge, and approximately 190 hair samples and 20 scat samples have been collected from the east side of the Kenai Peninsula. DNA extraction is proceeding via Quagen kits, and this winter we will proceed to sequencing and species identification.*
9. Preparation of reports and technical publications (9). *Multiple publications have been finished. Attached please find a list of current publications, as well as those in preparation.*

**III. ADDITIONAL FEDERAL AID-FUNDED WORK NOT DESCRIBED ABOVE THAT WAS ACCOMPLISHED ON THIS PROJECT DURING THIS SEGMENT PERIOD:** *There was none.*

**IV. FEDERAL AID TOTAL PROJECT COSTS FOR THIS SEGMENT PERIOD**

FEDERAL AID SHARE \$83,475 + STATE SHARE \$27,825 = TOTAL \$111,300

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**APPROVAL DATE:** \_\_\_\_\_

## **Bibliography: Federal Aid Research Report**

### Peer reviewed publications: published, including accepted abstracts, talks, and posters

- Goldstein, M. and S.D. Farley. 2003. "Analysis of brown bear den sites" Abstract accepted at 3rd International Wildlife Management Congress, 1-5 December 2003, Christchurch New Zealand
- Graves, T. and S.D. Farley. 2003. Frequency and distribution of highway crossings by Kenai Peninsula brown bears. Abstract accepted. The Int. Conf. on Ecology & Transportation(ICOET) August 24-29, 2003.
- Manly, B.F.J., L.L. McDonald, D. Thomas, T. McDonald and W.P. Erickson. 2002. Resource Selection by Animals, Statistical Design and Analysis of Field Studies. Kluwer Press
- Robbins, C. T., S. D. Farley, and G. V. Hilderbrand. 2003. Nutritional ecology studies on grizzly bears: A review of newer methods and management implications of such studies. Invited paper to be presented at 15th Int. Conf. On Bear Res. and Manage. Feb. 2003.
- Suring, L.H. and G. DelFrate. 2002. Spatial analysis of locations of brown bears killed in defense of life or property. *Ursus*. 13: 237–245.
- Suring, L.H., W. E. Erickson, S. Howlin, K. Preston, and M. Goldstein. 2003. Estimating resource selection functions using spatially explicit data. Proc. . *in* S. Huzurbazar, editor. Proceedings of the Resource Selection Function Conference, University of Wyoming, Laramie, Wyoming, USA.
- Suring, L. H., S. D. Farley, G. V. Hilderbrand, C. C. Schwartz, S. Howlin, and W. P. Erickson. 2003. Patterns of landscape use by brown bears on the Kenai Peninsula, Alaska, USA. Abstract accepted at 3rd International Wildlife Management Congress, 1-5 December 2003, Christchurch New Zealand

### Peer reviewed publications: in press, manuscript, or prep form

- Jackson, J.V., S. Talbot, and S. D. Farley. (*in manuscript form*) Genetic characterization of the Kenai brown bears (*Ursus arctos* L.): Microsatellite and MtDNA control region variation of the brown bears of Kenai Peninsula, south central Alaska.
- Farley, S. D., S. Talbot, and J. Jackson. (*in prep*). Differential reproductive success in a small brown bear population: comparison of genetics and telemetry data.
- Graves, T., S.D. Farley, and C. Servheen. (*in manuscript*) Frequency and distribution of highway crossings by Kenai Peninsula brown bears. To be submitted to *J. Wildl. Biol.* Fall 2003.
- Hilderbrand, G. V., C. C. Schwartz, C. T. Robbins, and T. A. Hanley. (*in review*). Energy value of Pacific salmon to consumers. *Ursus*
- Hilderbrand, G. V. and S. D. Farley (*in review*). Importance of salmon to wildlife: implications for integrated management. *Ursus*

Hilderbrand, G. V. (2003 abstract). Diet and body composition - Ecological insights and management implications. Annual meeting of the Wildlife Society, Burlington, VT. 2003.

Hilderbrand, G. V. and M. Ben-David. (2003 abstract). Effects of wildlife on ecosystem processes-investigations with isotopic tracers. Annual meeting of the Wildlife Society, Burlington, VT. 2003

Suring, L. H., S. D. Farley, G. V. Hilderbrand, C. C. Schwartz, S. Howlin, and W. P. Erickson. (in prep.). Patterns of landscape use by brown bears on the Kenai Peninsula, Alaska, USA. (to be submitted to Journal of Wildlife Management)

### Graduate student thesis work

Jackson, J. V. 2003. The conservation genetics of the brown bear (*Ursus arctos*) of the Kenai Peninsula, South-central Alaska. M.S. thesis. Alaska Pacific University. 53pp

Fortin, J. The role of salmon and berries in determining fall weight gain in brown bears. M.S. in progress. Washington State University.

Rode, K. Ecological relationships between recreationists and wildlife: The nutritional effects of wildlife viewing and angling on brown bear/salmon interactions. Ph.D. In progress. Washington State University.